Collaborative Augmented Reality - Current and Future Prospects

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Abstract: The world faces many problems dealing with a choice of products to choose from and also the question whether the product will satisfy ones particular needs or not. This is when Augmented Reality comes into picture. Though the existence of Virtual Reality hasn’t been beneficial up to larger extent, it is the Augmented reality technology that might have an edge over in the near future. This paper deals with various angles of Augmented Reality, as to how the technology can be applicable to the present real life situations and also a few of its advantages and disadvantages. This paper focus on the applications in which the existing technology can be replaced with Augmented reality in order to be helpful for the mankind.

Keywords: Augmented Reality, Virtual Reality, Future, Technological Advances, Experiencing Future

INTRODUCTION

The distinction of Augmented Reality (AR) is to improve our knowledge of the surroundings by combining diverse technologies like computing, display and sensing. The vision is one of the most important senses of the human being and hence most of the upcoming developments relating to Augmented reality have to work with human vision. Visual systems are also measured, but it is worth taking point that other sense systems, such as tactile feedbacks, olfactory feedbacks or auditory displays, even more important based on that particular instance of an individual. The distinctiveness of these systems can be understood from three classical and widely used criteria for AR systems A) Combines real and virtual display technology is required by Augmented reality which allows the client to concurrently see genuine data as well as virtual information in a combined perspective. Conventional displays can illustrate only images which are computer generated and are inadequate for Augmented reality. B) Registered in 3-D Augmented Reality depends on a close coupling between the real and the virtual world that is based solely on their relationship which is geometrical. This makes it probable to offer the virtual content with the right placement and 3D perspective with respect to the reality. C) It is must that AR system must run at interactive frame rates, such that it can overlay information in a real-time fashion and also allow user interaction.

Figure 1: Milgram's Reality-Virtuality Continuum

This definition of AR is not limited to any particular display technology. Nor this is restricted to the visual sense. Augmented reality can be applied to all senses, including hearing, sense, touch, etc. Some AR applications also involve eliminating real objects from the situation, in addition to adding virtual objects.[1][2]

II. AUGMENTED REALITY OVERVIEW

Augmented reality has been designated as a real-time candid or oblique vision of substantial world of nature which has been strengthened by accumulating the information generated by a virtual computer to it. Augmented reality is not confined to technological implementations of hardware but bears both real and virtual objects in a real environment as a combination. Apart from this, it registers both real as
well as virtual objects in unison and trends conjointly as three dimensions in a real environment. It is allied to a global notion known as mediated reality, in which the computer makes the user experience a disparate perspective of reality which is completely modifiable [17][13].

Virtual reality supplants the real world as a factitious one, giving users a false imprint whereas augmented reality technology operates by upgrading the user’s prevailing prospect of realism. As shown in Figure 1, the Milgram’s Reality-Virtuality continuum designated by Milgram and Kishino portrays augmented reality as a part of the mixed reality in as much as AR is apparently convenient to the real environment and virtual reality is convenient to a more virtual world and both these environments are commutable by a virtual one[9][17].

The information induced about the objects and its surroundings is overspread on the real surroundings and it can be virtual or real and this bestows the users with an interactive and digitally modifiable world as shown in figure 2. Thus, the objective of AR is to provide digital information to his adjoining environments and to make people lives effort free. It is also set to evolve the user’s discernment into the real world by making communications even better. Hence, it depicts applicable information into the real world by adjoining virtual objects which are served by computer graphics. Augmented reality is to enrich the efficiency for the interaction of humans and computers by improvising the tools of recognition in real world [18][19].

The technique to trace the markers coinciding formerly is done by the marker AR system. This system is characterized by a white backdrop coloured square frame and the marker behold amalgamates a three-dimensional object. In order to make up the feeble points of the marker AR system, the technique to use images in the real world have been implemented in the markerless AR system and it’s been apprehended as the most substantial and captious strategy till date in the area of augmented reality, as it determines , senses illumination, biased overlay and dictates on the warp of characteristics of objects as shown in figure 3. It mainly uproots the textures, lines, corners, points and other attributes that are drawn by the images captured [19].

As mentioned in this paper, most of the AR related projects are addressing human vision, technologies like wearable computing that are based on augmented realities are being implemented using integral visual features. Identification of the objects and its tracking has been a custom of computer vision while they are in motion. In today’s real world there are two prominent implementations in this area :

A. Face recognition which checks the database and assimilates the faces of the user’s against their images and if the recognition is fit, it returns the name and proper information about the user.

B. The approach of Pencigraphic imaging that creates a hallucination of virtual images that are afloat in a three dimensional space which is yet to be
superimposed on to the wearer’s universal visual area. The computer identifies the cashier and places a formerly accessed shopping list on him.

Thus, such techniques prove how the computer vision rightly supports the enrolment troubles in augmented reality and supports the users by adjusting the physical senses besides augmenting them [18][3][4].

III. EXCEPTIONS

In Augmented reality systems, the user seeks his proficiency initially in the type of the system display, sensing ability and the means of intercourse. The two techniques of sensing and display decide the productiveness and naturalism while merging both the real and virtual environments, but it may also have social aftereffects. On the other hand, the discreet AR systems, it highlights unchained techniques and aspects of physical environment which is not altered. This system handles issues in following three different areas.[6][7]

A. Display systems

The real and virtual objects are to be combined in the system while maintaining a clear view of the real environment. These system’s hardware comprise of head-worn, handheld or spatial systems. The approach that is used to avoid visual modifications constitutes 1.optical see-through displays 2.video see-through displays 3.direct projection and 4.spatially aware handheld displays. [21]

B. Sensing ability

The system should portray an idea of the correct image without any sensors or any equipment worn by the user. The association among the user’s perspective, type of display and the surroundings necessarily should be known for its accuracy and combinations of real and virtual objects must be correctly aligned. The usual techniques used to sense and retrieve the attributes in AR use electromagnetic, ultrasonic, optical or mechanical sensing. Technologies that include 1.camera-based techniques 2.head-worn displays 3.perspective-correct imagery 4.interactive tabletops are related closely to AR systems. The key challenges include detecting, identifying and tracking objects.

C. Means of interaction

The system should reinforce manipulation directly, while evading the obstructing technologies and should also gain the control over user-interface. Social aspects should be considered, as devices which are user-worn can be improper in many scenarios. So it would be beneficial to feature technologies which are interactive in order to elude potential variance and reduce the negative outcomes that the user may face during the usual interaction in real time. The distinct technologies that permit interaction with real world involve 1.Touch 2.Gesture and pose 3. Handheld devices and 4.Speech input[5] [20].

IV. STRATEGY TO AUGMENT REALITY

Various approaches that apply a few elemental strategies are:

A. Augmenting the User

The information regarding the physical objects is obtained by the users by wearing or carrying a device on their heads or hands.

B. Augmenting the Physical Objects

By entrenching the input and output within the devices computationally or within itself, the physical objects are altered.

C. Augmenting the environment around the user and the physical objects

The information about the surroundings is collected by self-reliant devices which displays information on the objects by capturing the interaction between the user and the objects [8][21].

V. APPLICATIONS

A. Facilitating Education and Training

When instructing a course that requires apparatus, proper exhibition is key for accomplishment. But with costly, inaccessible equipment, or on the prospect situations difficult to replicate. Augmented reality can be our new resolution to evade these expenses all at once. It is now promising with advanced augmented reality applications to provide
more valid knowledge and appoint learners in ways that were never probable before. Each learner can have their own exclusive breakthrough path through real-life immersive simulations, without having to worry about time pressure or real consequences if any errors creep in.[17][18]

B. Augmented Reality Expertise to the Service of Industrial Safeguarding

The advancement of augmented reality technology to help industries with accurate field information in real-time is today a anticipated realism to be used in any sphere of influence. For example, a project in building and construction will be more simple and securely carried out when site managers can virtually view and supervise work in progress in actual time through augmentation. Pointing a device to plant on-site portion of gear can match it to the digital chart of the plant and validate it in its chosen position, not only releasing the staff from burdensome paper outline plans but also providing the managers with essential reality background information. Manufacturing decision makers can make appropriate decisions when administration foresees how a section of equipment or a machine once manufactured will fit in its final setting, by having a glance at the summary of information fed through augmented reality devices as shown in figure 4.[13][14]

C. Promote Position-Based Services with Mobile Augmented Reality Systems

For instance imagine that while on a trip you are interested about an ancient monument and no-one’s around, you can just know things in matter of seconds. Just point your smart device camera towards the monument and it would add life to the monument on the screen, straddling across its history and a 3D real time model. Just take a snap of a museum and you will greeted with a virtual augmented reality preview of the exhibition that is running in it, before choosing to step in. [12]

D. Boost Conversion and Reduce Returns with Virtual Fitting Rooms

Just imagine that we are shopping for a product on an e-commerce site offering the likelihood to actually visualize the model we have chosen, to check which design or color suits us best and to pay for it all from the comfort of our house. Virtual dressing-rooms are now available with the use of augmented reality. The structure robotically detects relevant points on the body and accordingly aligns products ranging from shoes, clothes, jewellery, watches or glasses to produce a fit in on the gadget display.[10][11]

VI. ADVANTAGES OF AUGMENTED REALITY

Some advantages to augmented reality include:

- Increase in the interactive abilities.
- Surgeries & Operations will hence forth become less dangerous.
- Advancements in technology.
- The tourism will have a boost via rapid augmentation.
- Things will be made memorable and eye-catching.
- There would be a thin line between the virtual world and real world.
- Military Trainings will become much less expensive.
- All these advantages portray augmented reality as the next best thing.

Figure 4: Battlefield Augmented Reality System, a descendent of the Touring Machine. (Courtesy Naval Research Lab, Columbia University.)
VII. DISADVANTAGES OF AUGMENTED REALITY

Some disadvantages of augmented reality that could be disastrous and must be countered with improved security paradigms. Following are some probable demerits of AR:

- Privacy is a issue.
- Production is expensive.
- Augmented Reality Systems are difficult to maintain.
- The Performance Levels could be low.
- Permission isn’t taken during augmenting and information overload.
- The use of facial recognition technology which hasn’t been properly established combined with augmented data and geo-location.
- Militants can misuse this technology.
- By simply pointing their phone at victims, criminals can learn any necessary information they need to know about the victim.

VIII. FUTURE OF AUGMENTED REALITY

- Due to improvement in batteries, graphic chips, compasses and processors, the future smart phones will be able to handle Augmented Reality in a much smoother way.
- Substitution of cell phones: eye dialing on keypad, transfer of information straightaway into background.
- Awareness of surrounding is increased due to enhancement of Augmented Reality based information.
- A to-do list that might be displayed on the virtual wall clock that a person might first look at in the mornings.
- The use of Augmented Reality in the field of medicine is quite deterministic as one might visualize the improvements in his/her health after taking the drug.

IX. CONCLUSION

Unlike Virtual Reality, Augmented Reality (AR) has the objective of enhancing a person’s insight of the neighboring planet. Being half virtual and half real, the interface of Augmented Reality which is able to exhibit appropriate information at the right time and spot, offers numerous budding applications; these comprise of helping in tutoring, preparation, refurbish or preservation, manufacturing, medication, battleground, sports and amusement. In virtual reality, a simulation of reality is created but whereas in Augmented Reality, there is a mix of virtual with the real. This interface technology is sure to enhance what we feel, see, smell and hear. It has potential that extends beyond our perception and imagination. Almost each and every field will be benefited by augmented reality.[15][16]

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